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Two New Species of *Paraulopus* (Osteichthyes: Aulopiformes) from New Zealand and Eastern Australia, and comparisons with *P. nigripinnis*

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Two new paraulopid fishes, *Paraulopus okamurai* sp. nov. and *P. novaeseelandiae* sp. nov., are described on the basis of specimens collected from 235–553 m depth in eastern Australian and New Zealand waters. Within *Paraulopus*, the two new species are most similar to *P. nigripinnis* (Günther, 1878) in having a supraocular ridge, 4.5–5.5 transverse scale rows above the lateral line, and a large body size. *Paraulopus okamurai*, *P. novaeseelandiae*, and *P. nigripinnis* differ from one another in the following characters: caudal-fin coloration (black with a transverse white band on the upper lobe and a white tip on the lower lobe in *P. okamurai*; white with a black posterior margin on the upper lobe and a short, dark, oblique band on the lower lobe in *P. novaeseelandiae*; white with a black posterior margin on both lobes in *P. nigripinnis*), counts of pectoral-fin rays (modally 17 in *P. okamurai*, 18 in *P. novaeseelandiae*, and 16 in *P. nigripinnis*), and predorsal scales (modally 17 in *P. okamurai*, 18 in *P. novaeseelandiae*, and 14 in *P. nigripinnis*).
Key Words: Aulopiformes, Paraulopidae, *Paraulopus okamurai*, *Paraulopus novaeseelandiae*, new fish species, Southwest Pacific.

Introduction

Among the fishes previously included in *Chlorophthalmus* (Teleostei: Aulopiformes), Sato and Nakabo (2002) identified a hitherto unrecognized family (Paraulopidae), which they included under Synodontoidei (Aulopiformes). *Paraulopus*, the only known paraulopid genus, inhabits sandy-muddy bottoms on the shelf edges and upper parts of continental slopes in tropical and temperate waters of the Indo-West Pacific (Sato and Nakabo 2002; Nakabo 2002b).

Paraulopus contains eight nominal species as listed by Sato and Nakabo (2002), to which can be added "*Chlorophthalmus* sp. A" and "*Chlorophthalmus* sp. B", both recorded from New Zealand by Okamura (1990). The ten species of *Paraulopus* thus recognized so far can be divided into two groups on the basis of the following characters: number of transverse scale rows above the lateral line (TRa); presence or absence of a pair of exposed bony flanges in the interorbital region, herein named "supraocular ridges"; and body size. *Paraulopus nigripinnis* (Günther,

1878), "*Chlorophthalmus* sp. A", and "*Chlorophthalmus* sp. B" have TRa 4.5–5.5, supraocular ridge present, and large adult size (150–350 mm SL), and *P. oblongus* (Kamohara, 1953), *P. japonicus* (Kamohara, 1956), *P. maculatus* (Kotthaus, 1967), *P. legandi* (Fourmanoir and Rivaton, 1979), *P. brevirostris* (Fourmanoir, 1981), *P. filamentosus* (Okamura, 1982), and *P. albimaculatus* (Okamura, 1984) have TRa 2.5–3.5, no supraocular ridges, and small adult size (70–150 mm SL).

Okamura's (1990) "*Chlorophthalmus* sp. A" and "*Chlorophthalmus* sp. B" are very similar in appearance to *P. nigripinnis* (type species of *Paraulopus*). Nevertheless, because of several distinct character differences, they are herein described as new species of *Paraulopus*. A brief redescription of *P. nigripinnis* is included for purposes of comparison.

Although the common name "greeneyes" traditionally has been used for species of the Chlorophthalmidae *s. lat.*, this name subsequently has been largely restricted to members of the Chlorophthalmidae *sensu* Sato and Nakabo (2002). Glover (1994) used the name "cucumberfish" for *P. nigripinnis* because of its distinctive odor. This common name has not been used for other species of the Chlorophthalmidae *sensu* Sato and Nakabo (2002), and we herein adopt "cucumberfishes" as the common name for species of the Paraulopidae.

Methods for taking counts and measurements generally followed Nakabo (2002a). Counts of predorsal scales do not include a minute scale in front of the origin of the dorsal fin. Body width was measured between the bilateral origins of the pectoral fins. Interpelvic width was measured between the pelvic-fin origins. Standard length is expressed as SL. Institutional abbreviations follow Leviton *et al.* (1985). The original photographs of the three species of *Paraulopus* in Fig. 1 are deposited in NSMT. Proportional measurements and selected counts of *P. nigripinnis* and the two new species are given in Table 1. Paratype descriptions are given in parentheses in the text if different from the holotype.

Paraulopus nigripinnis (Günther, 1878)

(Japanese name: Oguro-aome-eso)

(Figs 1A, 2A, D, G, 3)

Chlorophthalmus nigripinnis Günther, 1878: 182 (type locality: off Twofold Bay, Australia); 1887: 193, pl. li, fig. A (Australia); Waite 1899: 54, fig. 4 (Australia); 1911: 164, pl. xxv (New Zealand); McCulloch 1911: 22 (Australia); Munro 1957: 15, fig. 262 (Australia); Kamohara 1956: 4 (description and key); Paulin *et al.* 1989: 105 (key); Paxton *et al.* 1989: 232 (list); Okamura 1990: 129, pl. 77 (New Zealand); Glover 1994: 268, fig. 239 (Australia); Paul 2000: 54 (New Zealand).

Paraulopus nigripinnis: Sato and Nakabo 2002: 27 (list).

Material examined. *Syntype*: BMNH 1887.12.7.207 (one of the two syntypes), 129.4 mm SL, off Twofold Bay, Australia, 120 ftm (*ca.* 220 m depth). *Other specimens* (n=90, 126.2–246.2 mm SL): AMS I.27333004 (one of two specimens), 219.3 mm SL, off Jervis Bay, Australia; FAKU 109183 (20 specimens), 127.0–172.1 mm SL, 39°50.5′S, 172°31.3′E, New Zealand, 250 m depth, R/V *Kaiyo-maru*, 27 Nov. 1970; FAKU 40268, 44116, 44118, 110940–110961, 110963, 110964, 110966–110968, 126.2–174.4 mm SL, 39°35.2′S, 171°53.0′E, off Cape Farewell, New Zealand, R/V *Kaiyo-maru*, 27–28 Nov.

1970; FSFL EA502, 166.9 mm SL, 34°03.5′S, 124°56.0′E, southern Australia, 432 m depth, R/V *Kaiyo-maru*, 26 Nov. 1975; FSFL EB950 (3), 175.1–191.0 mm SL, 33°19.9′S, 126°15.0′E, 450 m depth, R/V *Kaiyo-maru*, 27 Nov. 1975; FSFL EC057, 181.5 mm SL, 34°58.2′S, 151°06.7′E, off Sydney, 381 m depth, R/V *Kaiyo-maru*, 31 Dec. 1975; FSFL EC590, EC598, 171.6–193.1 mm SL, 34°47.0′S, 151°05.2′E, off Sydney, 166 m depth, R/V *Kaiyo-maru*, 31 Dec. 1975; FSFL EC834 (2), 183.0–193.1 mm SL, 33°23.2′S, 128°40.8′E, 423 m depth, R/V *Kaiyo-maru*, 29 Nov. 1975; FSFL EC895, 246.2 mm SL, 34°51.7′S, 151°07.5′E, off Sydney, 236 m depth, R/V *Kaiyo-maru*, 31 Dec. 1975; FSFL ED044-1–ED044-5, 162.1–196.2 mm SL, 34°36.7′S, 151°11.5′E, off Sydney, 229 m depth, R/V *Kaiyo-maru*, 31 Dec. 1975; FSFL JapanL388, JapanM413, JapanM577, JapanM594, JapanQ251, 142.5–200.1 mm SL, southeast Australia, other data unknown; HUMZ 65670, 65671, 191.9–201.4 mm SL, off New Zealand, 9 Mar. 1975; HUMZ 66599, 66600,

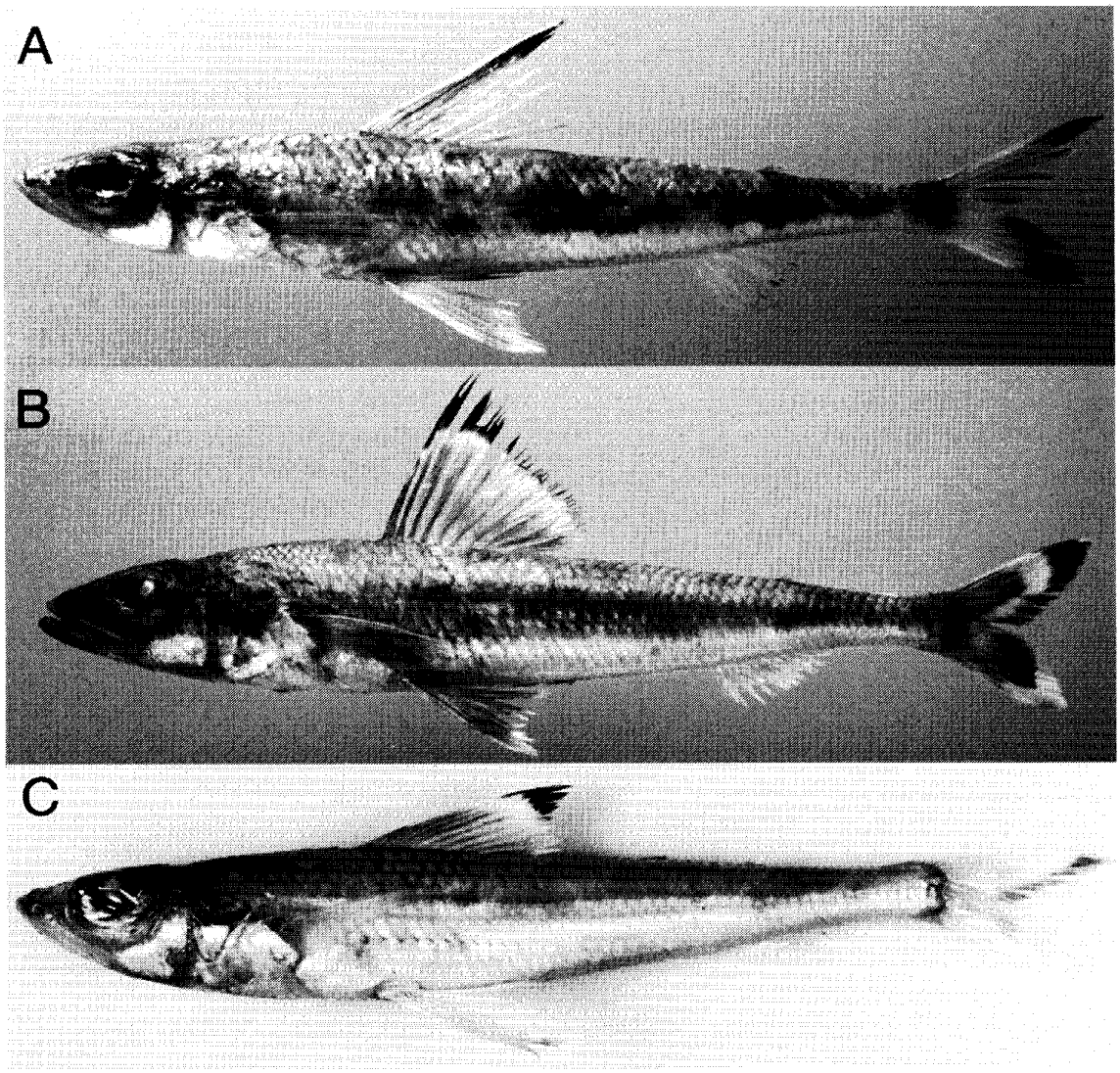

Fig. 1. Three species of *Paraulopus* from Australia and New Zealand when fresh. A, *Paraulopus nigripinnis*, NSMT-P43243, male, 207 mm SL; B, *Paraulopus okamurai* sp. nov., holotype, NSMT-P41193, female, 308 mm SL; C, *Paraulopus novaeseelandiae* sp. nov., holotype, NSMT-P62013, female, 239 mm SL.

66608, 66611, 66615, 136.4–168.3 mm SL, off New Zealand, 8 Sep. 1974; NSMT-P42572, 179.5 mm SL, 43°38′S, 173°53′W, 102–104 m depth, 6 Mar. 1983; NSMT-P43242 (5), NSMT-P43243, NSMT-P43244 (6), 200.3–245.7 mm SL, 43°16′S, 177°34′W, 338–351 m depth, 21 Mar. 1983.

Description. Snout short. Nostrils located midway between snout tip and anterior margin of orbit; anterior and posterior nostrils nearly equal in size. Eye large, directed dorsolaterally. Interorbital space almost flat. Supraocular ridge present, not reaching posterior margin of orbit. Anus slightly closer to pelvic-fin base than to origin of anal fin.

Color when fresh (NSMT-P43243, male). Body brown above with irregular, blackish-brown blotches on lateral surface, silvery below. Cheek silvery. Tip of dorsal fin black. Pectoral fin transparent. Pelvic fin faintly dark in middle. Posterior margins of both lobes of caudal fin each with black band of pigment, but anteroventral portion of band on upper lobe faint. Adipose fin transparent.

Color in alcohol. Body brown with blackish-brown blotches. Buccal cavity brown. Branchial cavity dark posteriorly. Anal fin transparent, with black margin in males. Caudal fin pigment paler than in fresh.

Size. Maximum recorded length about 250 mm SL.

Distribution and habitat. Known from Australia (recorded around southern half of continent, from off Port Stephans, N.S.W. to Cape Cuvier, W.A., including Tasmania) and New Zealand including the Kermadec Is. (Paxton *et al.* 1989; Okamura 1990; Glover 1994; Paul 2000) (Fig. 3). Glover (1994) described *P. nigripinnis* as being most frequently recorded from off southeast Australia and abundant in the Great Australian Bight. Normal capture depths have ranged from 220 to 450 m although the shallowest recorded depth is 65 m (Glover 1994).

Remarks. Okamura (1982) described sexual dimorphism in *Paraulopus filamentosus* (formerly *Chlorophthalmus filamentosus*). *Paraulopus nigripinnis* also exhibits sexual dimorphism in anal-fin coloration, at least in males of greater than approximately 126 mm SL (Fig. 2A).

Paraulopus okamurai sp. nov.
(Figs 1B, 2B, E, H, 3)

Chlorophthalmus sp. B: Okamura 1990: 131, pl. 79 (off North Cape, New Zealand).

Material examined. *Holotype*: NSMT-P41193, female, 307.8 mm SL, 30°21′S, 173°03′E, Three Kings Rise, north of New Zealand, 478 m depth, R/V *Shinkai-maru*, 23 Apr. 1985.

Paratypes (n=10, 192.4–315.4 mm SL): Tasman Sea: AMS I.41170-001, 275.2 mm SL, 30°36.3′S, 156°12.2′E, Derwent-Hunter Guyot, 394–398 m depth, R/V *Kaiyo-maru*, 14 Dec. 1976; NSMT-P41192, 296.3 mm SL, data as for holotype; NSMT-P62017, 62018, 192.4–232.7 mm SL, 30°34.9′S, 156°09.3′E, Derwent-Hunter Guyot, 467–476 m depth, R/V *Kaiyo-maru*, 13 Dec. 1976; NSMT-P62020, 62021, 211.8–215.0 mm SL, 30°50.6′S, 156°15.6′E, Derwent-Hunter Guyot, 310 m depth, R/V *Kaiyo-maru*, 13 Dec. 1976; NSMT-P62024, 315.4 mm SL, 32°25.7′S, 179°08.0′W, 235–322 m depth, R/V *Kaiyo-maru*, 28 Dec. 1976; NSMT-P62025, 291.3 mm SL, 32°10.1′S, 179°04.0′W, 286–381 m depth, R/V *Kaiyo-maru*, 30 Dec. 1976; NMNZ P37939, 211.0 mm SL, 30°50.6′S,

156°15.6′E, Derwent-Hunter Guyot, 310 m depth, R/V *Kaiyo-maru*, 13 Dec. 1976; NMNZ P37940, 272.8 mm SL, 32°25.7′S, 179°08.0′W, 235–322 m depth, R/V *Kaiyo-maru*, 28 Dec. 1976.

Diagnosis. A species of *Paraulopus* with the following combination of characters: dorsal fin dusky with black margin bordering narrow, distinctive, white band; caudal fin black with narrow, roughly transverse, white band in middle of upper lobe and white distal tip on lower lobe; usually with 17 pectoral-fin rays; usually with 17 predorsal scales.

Description. Body elongate, subcylindrical. Maxilla reaching posteriorly to below middle of pupil. Small, conical teeth on jaws arranged in six (six or seven) rows anteriorly; number of rows tapering posteriorly. Vomer with three (two or three) irregular rows of small, conical teeth. Palatine with small, conical teeth arranged in two rows. Tongue broad anteriorly, with bottle-shaped patch of small, canine-like teeth anteromedially (posterior portion absent in some paratypes). Snout short. Nostrils located midway between snout tip and anterior margin of orbit; anterior and posterior nostrils nearly equal in size. Eye large, directed dorsolaterally. Interorbital space almost flat. Supraocular ridge short, not reaching posterior margin of orbit. Upper part of opercular flap protruding posteriorly. Deciduous scales present on body, cheeks, and upper portion of opercle. Anus slightly closer to origin of anal fin than to that of pelvic fin. Margin of dorsal fin slightly concave. Anal fin small; base short. Origin of adipose fin above ninth (eighth or ninth) anal-fin ray. Pectoral fin short, reaching posteriorly to vertical throught tenth (ninth or tenth) dorsal-fin ray. Posterior margin of pelvic fin emarginate; outer rays longer than inner rays; tip of outermost ray covered with thick skin (not covered in smaller paratypes). Interpelvic region broad, 13.1% of SL (12.3–14.1% of SL).

Color when fresh (known only from holotype, female). Body dark brown with irregular, blackish-brown blotches on lateral surface, silvery below. Cheek silvery. Opercle dark above, silvery below. Dorsal fin dusky with black distal margin bordering distinctive white band. Anal, pectoral, and adipose fins transparent. Pelvic fin blackish-brown. Caudal fin black with narrow, transverse, white band in middle of upper lobe and white distal tip on lower lobe.

Color in alcohol. Body dark brown with irregular, blackish-brown blotches. Cheek brown. Opercle dark. Buccal cavity brown. Branchial cavity and pharynx black. Branchiostegal membrane pale on outer surface, black on inner surface.

Size. Maximum recorded length about 300 mm SL.

Distribution. Presently known only from southeast Australia, Three Kings Rise, and the southern Kermadec Ridge, from 30°S to 32°S, at depths between 235 and 480 m (Fig. 3).

Etymology. Named in honor of Dr. Osamu Okamura, who first recognized the uniqueness of this species.

Remarks. No sexual dimorphism was evident in the specimens examined.

Paraulopus novaeseelandiae sp. nov.
(Figs 1C, 2C, F, I, 3)

Chlorophthalmus sp. A: Okamura 1990: 130, pl. 78 (Challenger Plateau, New

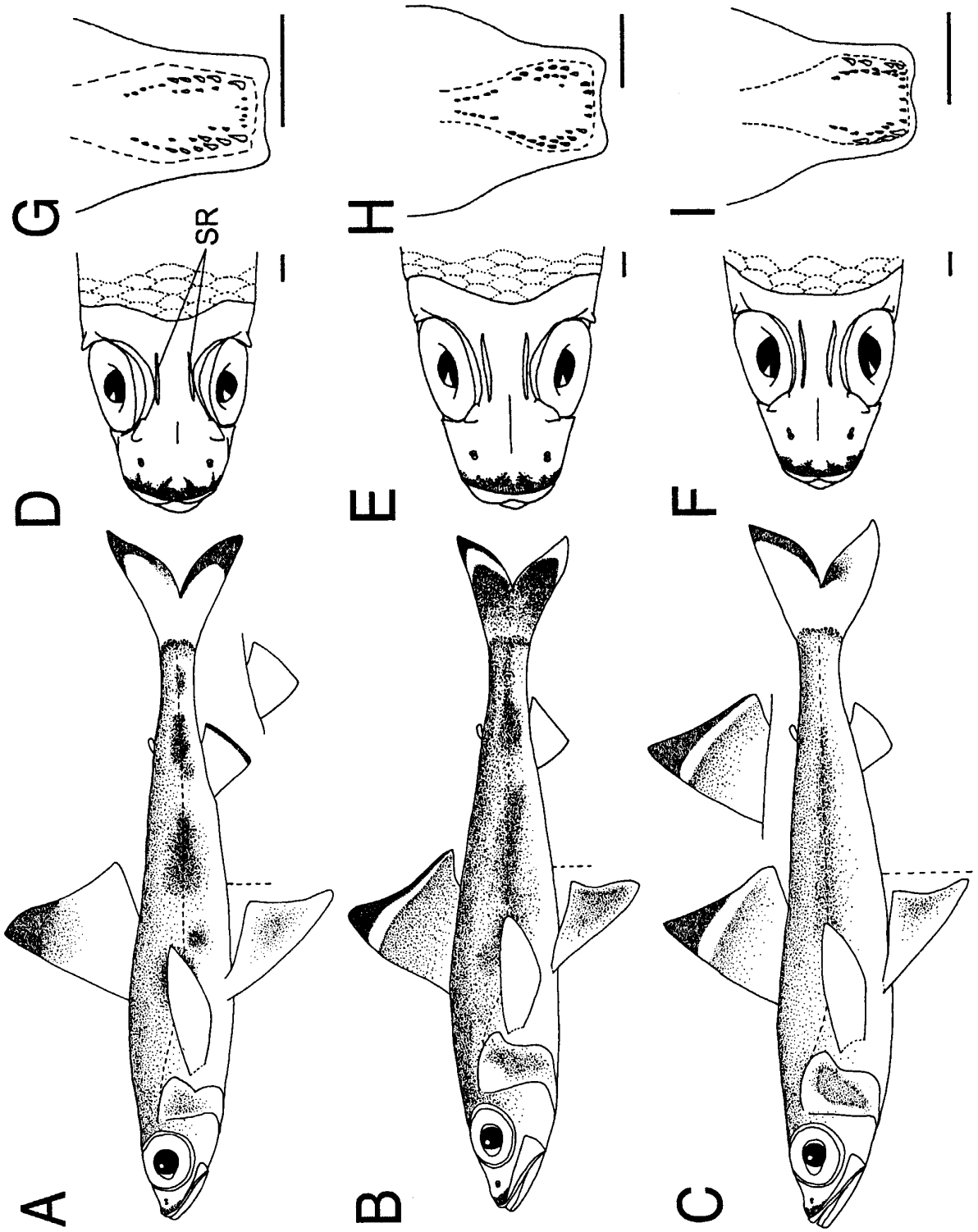

Fig. 2. Lateral views of body (A–C), dorsal views of head (D–F), and illustrations of tongues (G–I) of three species of *Paraulopus*. A, D, G, *P. nigripinnis*: A, whole body of NSMT-P43243, male, 207 mm SL (upper) and anal fin of NSMT-P43244, female, 226 mm SL (lower); D, G, syntype, BMNH 1887.12.7.207, 129 mm SL. B, E, H, *P. okamurai* sp. nov., holotype, NSMT-P41193, female, 308 mm SL. C, F, I, *P. novaeseelandiae* sp. nov.: C, dorsal fin of paratype, NSMT-P62014, male, 222 mm SL (upper) and whole body of holotype, NSMT-P62013, female, 239 mm SL (lower); F, I, holotype. SR, supraocular ridges. Scales: 5 mm.

Zealand).

Material examined. *Holotype*: NSMT-P62013, female, 238.6 mm SL, 29°35.0′S, 168°05.8′E, off Norfolk Is., Australia, 308 m depth, R/V *Kaiyo-maru*, 17 Jan. 1976.

Paratypes (n=17, 196.2–355.4 mm SL): Challenger Plateau, New Zealand: AMS I.41171-001, 274.2 mm SL, 38°46.6′S, 168°27.5′E, 510 m depth, R/V *Kaiyo-maru*, 27 Nov. 1970; FAKU 43990, 43991, 44119, 196.2–297.4 mm SL, 39°35.2′S, 171°53.0′E, 250m depth, R/V *Kaiyo-maru*, 27–28 Nov. 1970; FAKU 109906, 109907, 267.2–314.7 mm SL, 38°56.6′S, 169°01.0′E, 500 m depth, R/V *Kaiyo-maru*, 27 Nov. 1970; FAKU 110862, 110864, 110866–110868, 246.4–306.2 mm SL, 38°46.6′S, 168°27.5′E, 510 m depth, R/V *Kaiyo-maru*, 27 Nov. 1970; NSMT-P43190, 263.2 mm SL, 38°16′S, 168°57′E, 490–494 m depth, 6 Jan. 1983; NSMT-P62014, 221.6 mm SL, data as for holotype; NSMT-P62015, 62016, 295.3–355.4 mm SL, 39°08.0′S 168°32.5′E, 553 m depth, R/V *Shinkai-maru*, 3 Nov. 1975; NMNZ P37941 (2 specimens), 246.4–259.4 mm SL, 38°46.6′S, 168°27.5′E, 510 m depth, R/V *Kaiyo-maru*, 27 Nov. 1970.

Diagnosis. A species of *Paraulopus* with the following combination of characters: dorsal fin dusky with black margin bordering narrow, distinctive, white band; caudal fin white, its posterior margin of upper lobe black and lower lobe with short, dark, oblique band; usually with 18 pectoral-fin rays; usually with 18 predorsal scales.

Description. Body elongate, subcylindrical. Maxilla reaching posteriorly to below middle of pupil. Small, conical teeth on jaws arranged in five (five to seven) rows anteriorly; number of rows tapering posteriorly. Vomer with small, conical teeth arranged in three (two or three) irregular rows. Palatine with small, conical teeth arranged in two rows. Tongue broad anteriorly, with U-shaped patch of small, canine-like teeth anteromedially. Snout short. Nostrils located midway between snout tip and anterior margin of orbit; anterior and posterior nostrils nearly equal in size. Eye large, directed dorsolaterally. Interorbital space almost flat. Supraocular ridge not reaching posterior margin of orbit. Upper part of oper-

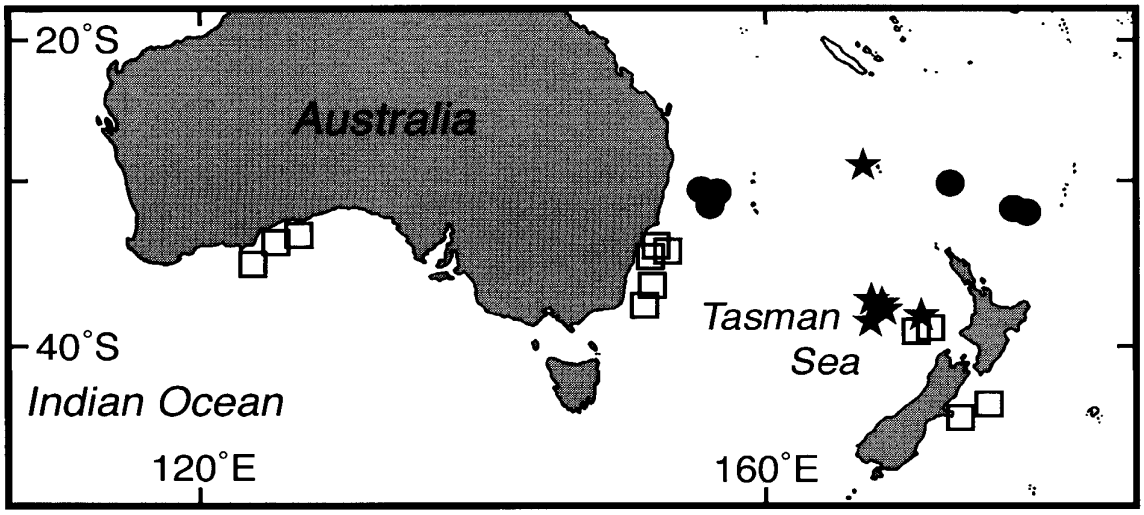

Fig. 3. Sampling localities of the three paraulopid species examined in this study. Open squares, *Paraulopus nigripinnis*; solid circles, *P. okamurai* sp. nov.; solid stars, *P. novaeseelandiae* sp. nov.

Table 1. Proportional measurements* and counts** of *Paraulopus nigripinnis*, *P. okamurai* sp. nov., and *P. novaeseelandiae* sp. nov.

	P. nigripinnis		*P. okamurai* sp. nov.		*P. novaeseelandiae* sp. nov.	
	Syntype	Non-type specimens n=90	Holotype	Paratypes n=10	Holotype	Paratypes n=17
Standard length (mm)	129.4	126.2–246.2	307.8	192.4–315.4	238.6	196.2–355.4
Measurements (%SL)						
Body depth	18.5	14.2–19.5 (16.6, 90)	17.5	14.2–20.3 (18.3, 10)	17.4	15.8–21.0 (17.7, 17)
Body width	16.5	13.8–18.2 (15.8, 90)	17.4	15.6–19.4 (17.8, 10)	17.4	15.8–19.0 (17.4, 17)
Head length	24.9	26.3–32.2 (28.8, 90)	29.9	30.4–32.1 (31.5, 10)	30.9	29.2–31.9 (30.5, 17)
Preanus length	57.3	52.5–59.0 (55.1, 90)	57.1	56.3–60.5 (58.3, 10)	57.5	54.1–59.8 (56.9, 17)
Predorsal length	34.7	35.0–39.9 (37.5, 90)	37.9	39.0–40.6 (39.7, 10)	38.6	36.9–41.7 (39.0, 17)
Prepectoral length	30.9	26.6–32.6 (28.6, 90)	29.5	30.1–33.1 (31.6, 10)	31.4	29.4–32.8 (30.7, 17)
Prepelvic length	44.3	36.0–43.3 (39.6, 90)	40.2	40.0–44.4 (41.4, 10)	41.6	38.4–42.9 (40.3, 17)
Preanal length	73.3	70.0–75.2 (72.4, 90)	73.2	72.6–75.1 (73.9, 10)	74.4	71.6–73.7 (72.7, 17)
Dorsal-fin base	14.0	11.1–14.8 (13.1, 90)	14.0	12.9–14.6 (13.7, 10)	13.1	12.5–14.1 (13.2, 17)
Pectoral-fin length	broken	18.4–21.8 (19.8, 79)	19.6	19.7–22.3 (21.2, 10)	18.9	18.7–22.4 (20.9, 17)
Pelvic-fin length	22.3	19.4–23.6 (21.6, 89)	18.7	20.1–23.2 (21.8, 10)	21.7	21.8–24.4 (23.0, 17)
Interpelvic width	11.3	10.6–12.5 (11.6, 90)	13.1	12.3–14.1 (13.4, 10)	12.6	12.4–14.1 (13.1, 17)
Pelvic-fin origin to anus	17.3	14.5–18.9 (16.8, 90)	18.6	17.0–20.2 (18.2, 10)	18.2	16.8–19.1 (17.9, 17)
Anus to anal-fin origin	18.6	15.2–19.3 (17.4, 90)	16.4	15.1–16.5 (15.8, 10)	16.8	13.4–17.4 (16.0, 17)
Anal-fin base	8.9	7.1–9.2 (8.1, 90)	9.0	7.5–9.1 (8.3, 10)	8.0	7.6–9.7 (8.3, 17)
Caudal peduncle length	20.8	18.0–21.9 (20.3, 90)	18.6	18.2–19.9 (19.2, 10)	19.4	18.8–21.0 (20.1, 17)
Caudal peduncle depth	5.2	4.7–6.1 (5.3, 90)	5.8	5.7–6.9 (6.4, 10)	6.2	5.9–6.7 (6.3, 17)
Measurements (%HL)						
Head depth	68.3	46.3–65.3 (54.7, 90)	58.7	46.7–59.7 (56.1, 10)	50.3	49.4–61.9 (54.9, 17)
Snout length	29.0	22.0–27.8 (24.2, 90)	26.1	24.1–27.9 (26.0, 10)	27.2	24.3–27.6 (25.8, 17)
Orbit diameter	45.8	33.9–43.9 (39.1, 90)	35.0	34.6–39.6 (37.6, 10)	37.7	34.9–39.1 (36.7, 17)
Interorbital width	11.3	7.3–10.7 (9.4, 90)	11.3	8.1–10.2 (9.2, 10)	9.9	7.9–10.6 (8.9, 17)
Upper jaw length	49.9	42.4–48.2 (44.9, 90)	45.7	44.4–48.5 (46.5, 10)	48.9	44.7–48.8 (46.7, 17)

Table 1. Continued

	P. nigripinnis		*P. okamurai* sp. nov.		*P. novaeseelandiae* sp. nov.	
	Syntype	Non-type specimens n=90	Holotype	Paratypes n=10	Holotype	Paratypes n=17
Counts						
Dorsal-fin rays	11	11–12 (11)	11	10–11 (11)	11	11
Anal-fin rays	10	9–11 (10)	11	10–11 (10)	10	9–11 (10)
Pectoral-fin rays	16	15–17 (16)	17	16–17 (17)	17	17–19 (18)
Pelvic-fin rays	9	9	9	9	9	9
Branchiostegal rays	8	7–8 (8)	8	8	8	7–8 (8)
Gill rakers	6+20	6–8+18–21 (7+19)	8+18	7–9+17–19 (8+18)	8+20	7–11+18–19 (8+18)
Pored lateral-line scales	51	50–53 (51)	51	49–52 (50)	51	50–53 (51)
Scales above lateral line	4.5	4.5–5.0 (4.5)	4.5	4.5	4.5	4.5–5.5 (4.5)
Scales below lateral line	4.5	3.5–4.5 (4.5)	4.5	3.5–4.5 (4.5)	4.5	4.5
Predorsal scales	14	13–16 (14)	19	14–19 (17)	18	16–20 (18)
Cheek scales	3	3	3	3	3	3
Vertebrae	49	48–50 (49)	49	48–50 (49)	50	49–51 (49)

* Mean values and sample sizes given in parentheses.
** Modal values given in parentheses.

cular flap protruding posteriorly. Deciduous scales present on body, cheeks, and upper part of opercle. Anus slightly closer to origin of anal fin than to that of pelvic fin. Margin of dorsal fin slightly emarginate. Anal fin small; base short. Origin of adipose fin above ninth (eighth to tenth) anal-fin ray. Pectoral fin reaching posteriorly to vertical through ninth (ninth to 11th) dorsal-fin ray. Outer rays of pelvic fin longer than inner rays. Interpelvic region broad, 12.6% of SL (12.4–14.1% of SL).

Color when fresh (known only from holotype, female). Body pale brown above, silvery below. Cheek silvery. Opercle dark brown above, silvery below. Dorsal fin dusky with black distal margin bordering distinct white band. Anal, pectoral, pelvic, and adipose fins transparent. Caudal fin white with black margin on upper lobe and short, dark, oblique band on lower lobe.

Color in alcohol. Body pale brown. Buccal cavity brown. Branchial cavity and pharynx dark. Branchiostegal membrane mostly transparent, blackish-brown on inner surface. Black distal margin of dorsal fin extending further posteriorly in males (to last ray) than in females (to sixth or seventh ray); dorsal fin pale proximally.

Size. Maximum recorded length about 350 mm SL.

Distribution and habitat. Presently known only from the Tasman Sea west of New Zealand and off Norfolk Is. at depths between 250 and 550 m (Fig. 3).

Etymology. This species is named *novaeseelandiae* in reference to New Zealand, from where almost all the type material was collected.

Remarks. *Paraulopus novaeseelandiae* exhibits sexual dimorphism in the length of the black band on the distal margin of the dorsal fin (Fig. 2C).

Discussion

Paraulopus okamurai, *P. novaeseelandiae*, and *P. nigripinnis* are clearly distinguishable from other species of *Paraulopus* in having 4.5–5.5 transverse scale rows above the lateral line, a supraocular ridge, and a large body size (150–350 mm SL). They are similar to one another in sharing black margins on the dorsal and caudal fins, usually 50–52 pored lateral-line scales, 48–51 vertebrae, and 3 cheek scale rows.

Paraulopus okamurai and *P. novaeseelandiae* can be distinguished from *P. nigripinnis* by the presence of a distinct white band on the dorsal fin (vs. no white band), a white posterior tip on the lower caudal lobe (vs. black tip), more gill rakers on the upper arch (modally 8 in *P. okamurai* and *P. novaeseelandiae* vs. 7 in *P. nigripinnis*), fewer gill rakers on the lower arch (modally 18 vs. 19), more pectoral-fin rays (modally 17–18 vs. 16), more predorsal scale rows (modally 17–18 vs. 14), and a greater interpelvic width (12.3–14.1% of SL in *P. okamurai* and 12.4–14.1% in *P. novaeseelandiae* vs. 10.6–12.5% in *P. nigripinnis*) (Table 1).

Paraulopus okamurai and *P. novaeseelandiae* differ from each other in caudal-fin coloration (black with a transverse white band on the upper lobe in *P. okamurai* vs. white with a black posterior margin on the upper lobe and a short, dark, oblique band on the lower lobe in *P. novaeseelandiae*), counts of pectoral-fin rays (modally 17 in *P. okamurai* vs. 18 in *P. novaeseelandiae*), and counts of predorsal scale rows (modally 17 in *P. okamurai* vs. 18 in *P. novaeseelandiae*) (Table 2).

Okamura (1990) noted that *P. okamurai* (his "*Chlorophthalmus* sp. B") had a

Table 2. Frequency distributions of selected counts in three species of *Paraulopus*.

	Upper arch gill rakers						Lower arch gill rakers					Total gill rakers						
	6	7	8	9	10	11	17	18	19	20	21	24	25	26	27	28	29	30
P. nigripinnis (n=91*)	24	57	9					4	45	39	3	2	17	34	30	4	3	
P. okamurai sp. nov. (n=11)		1	9	1			1	6	4				1	7	2	1		
P. novaeseelandiae sp. nov. (n=18)		4	8	3	2	1		12	5	1			4	4	6	2	1	1

	Pectoral-fin rays						Predorsal scales							
	15	16	17	18	19	20	13	14	15	16	17	18	19	20
P. nigripinnis (n=91*)	10	72	9				6	47	34	3				
P. okamurai sp. nov. (n=11)		1	10					1		3	5	1	1	
P. novaeseelandiae sp. nov. (n=18)			5	12	1					2	3	9	3	1

* Including damaged specimens.

longer caudal peduncle than *P. nigripinnis*. However, *P. okamurai* could not be differentiated from *P. nigripinnis* on the basis of caudal peduncle length in this study (Table 1).

Paraulopus nigripinnis is more widespread geographically than *P. okamurai* and *P. novaeseelandiae* (Fig. 3). However, the geographic distributions of *P. okamurai* and *P. novaeseelandiae* reported herein are derived from data for few specimens, and the distributions of these species may be more extensive. According to Paxton *et al.* (1989) and Glover (1994), *P. nigripinnis* is broadly distributed from western Australia eastward to New Zealand. Specimens identified as *P. nigripinnis* by them should be reexamined, and their identities reconfirmed, because of possible confusion with *P. okamurai* and *P. novaeseelandiae*. For this reason, the geographical distribution given here for *P. nigripinnis* has been based only on specimens examined in this study.

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